

Remarks

The Applicants have amended Claims 1, 6, 11 and 14 to recite that the ferrite grain diameter d_f corresponding to a circle is about 3.4 μm to 7.9 μm . Also, Claims 1, 6, 11 and 14 have been amended to recite that the fatigue endurance after quenching is 500 MPa or more. Support for the changes to the ferrite grain diameter d_f may be found in the Applicants' Specification on page 18 in paragraph [0050] with respect to the 7.9 μm upper portion of the range. Similarly, the lower portion of the range at 3.4 μm may be found on page 34 in Table 4 at item No. 1. Support for the fatigue endurance range may be found on page 18 of the Applicants' Specification in paragraph [0050]. Entry of the above amendments into the official file is respectfully requested.

The Applicants note with appreciation the Examiner's helpful additional comments in the Advisory Action. The Applicants particularly note with appreciation the apparent withdrawal of at least a portion of the rejection based on Yoshinaga. The Applicants provide further additional comments with respect to Yoshinaga so that it is clear that the subject matter of Claims 1, 6, 11 and 14 is not obvious over that publication.

Yoshinaga discloses under the heading of "Technical Field" in column 1 "a steel pipe, used for panels, undercarriage components and structural members of cars and the like, and a method of producing the same. The steel pipe is especially suitable for hydraulic forming."

Also, Item (10) covering columns 3 to 4 recites that, "according to this invention, a steel pipe having predetermined composition and predetermined texture component is heated to a temperature in the range from 650°C or higher to 1,200°C or lower and by applying working under a condition of a diameter reduction ratio of 30% or more and a wall thickness reduction ratio of 5% or more to 30%, the steel pipe becomes to have predetermined texture component

thereby a steel pipe which is especially suitable for hydraulic forming is obtained.” The average crystal grain size of the ferrite of the steel pipe at this stage is 10 μm or larger, preferably, 20 μm or larger and yet more preferably, 30 μm or larger, as recited in line 62 in column 12 to line 3 in column 13.

In sharp contrast, the Applicants’ Claims 1, 6, 11 and 14 as set forth in the description under the heading of Technical Field on page 1 of their application recite that “The present invention relates to steels suitably used for structural parts of automobiles and a method for producing the same. In particular, the present invention relates to improvements in formability, fatigue endurance after quenching, low temperature toughness, and resistance for hydrogen embrittlement of steels used as materials for forming and quenching suspension arms and axle beams.” Further, pipes according to Claims 1, 6, 11 and 14 are not used for hydraulic forming, as in Yoshinaga and, therefore, reduction of diameter is not conducted by the Applicants on pipes as performed by Yoshinaga.

Also, with respect to the average ferrite grain diameter d_f corresponding to a circle according to Claims 1, 6, 11 and 14 and as described in the Applicants’ specification in paragraph No. [0050] on page 18 and the ferrite grain diameter $d_f = 3.4 \mu\text{m}$ of No. 1 in Table 4 on page 34, the average ferrite grain diameter d_f corresponding to a circle is 3.4 μm to 7.9 μm . This range of grain diameter is outside of the range disclosed or suggested by Yoshinaga.

Further, by specifying the average ferrite grain diameter d_f corresponding to a circle to 3.4 μm to 7.9 μm , on the basis of Fig. 4 and the description in paragraph No. [0050] provided on page 18 of the Applicants’ specification, 500 MPa or more of the fatigue endurance after quenching becomes possible. Moreover, by specifying the total x of multiplying factors of the respective elements to satisfy the value of 1.2 to 1.7, on the basis of Fig. 3 and the description

provided in paragraph No. [0046] on page 17 of the Applicants' specification, 500 MPa or more of the fatigue endurance after quenching becomes possible. In addition, by specifying C_{eq} to 0.4 to 0.58 on the basis of Fig. 1 and the description provided in paragraph No. [0041] on page 15 of the Applicants' specification, 500 MPa or more of the fatigue endurance after quenching becomes possible.

Nevertheless, Yoshinaga does not disclose, teach or suggest obtaining 500 MPa or more of the fatigue endurance after quenching which is achieved by controlling (a) the average ferrite grain diameter d_f corresponding to a circle, (b) C_{eq} and (c) the total x of multiplying factors according to Grossman. The Applicants respectfully submit that Claims 1, 6, 11 and 14, together with all the claims depending therefrom, are anything but obvious over Yoshinaga. Confirmation of withdrawal of the rejection is respectfully requested.

The Applicants respectfully submit that Hasegawa is also inapplicable. Hasegawa discloses under the heading "Field of Invention" in paragraph No. [0001] in column 2 that "the steel can be used for the offshore structure, a pressure vessel, shipbuilding, a bridge, a building, and a line pipe, for example, and is useful in particular as steel materials for structures, such as construction and a bridge which are required to be equipped especially with earthquake resistance. Although the shape as a steel material is not required in particular, the steel is useful for a steel plate, particularly as a material steel for manufacturing a steel plate, pipe or shape steel, which are applied as a structural member to which, low-temperature toughness is required." Also, as recited in Claim 1 and Abstract in column 1, "In the method for manufacturing the high tensile steel having high toughness and high ductility, ultrafine-grained steel having prescribed components and also having 1-3 μm average ferrite grain size and $\leq 50\%$ fraction of second phase is subjected to heat treatment in two-phase region under the following

conditions: heating temperature, (A_{c1} transformation point + 10°C) to (A_{c1} transformation point + 100°C); holding time, ≤ 5 hr; average cooling rate through the temperature region from the heating temperature to 200°C, is 0.1 to 100°C/s. By this method, two-phase structure can be formed while suppressing the coarsening of ultrafine-grained structure, and toughness can be combined with uniform elongation.”

On the other hand, as described in the Applicants’ specification on page 1 under the heading “Technical Field,” the Applicants’ Claims 1, 6, 11 and 14 relate to steels suitably used for structural parts of automobiles and a method for producing the same. In particular, the Applicants claimed subject matter relates to improvements in formability, fatigue endurance after quenching, low temperature toughness, and resistance for hydrogen embrittlement of steels used as materials for forming and quenching suspension arms and axle beams. There is no heat treatment process by slow cooling after two-phase region heating to pipe as applied by Hasegawa.

Also, pertaining to the average ferrite grain diameter d_f corresponding to a circle according to the Applicants’ Claims 1, 6, 11 and 14, in view of the Applicants’ description in paragraph No. [0050] on page 18 and the ferrite grain diameter $d_f = 3.4 \mu\text{m}$ of No. 1 in Table 4 on page 34, the average ferrite grain diameter d_f corresponding to a circle is $3.4 \mu\text{m}$ to $7.9 \mu\text{m}$ and this range of grain diameter is outside of the range (average ferrite grain diameter is 1 to 3 μm) disclosed by Hasegawa.

Further, by specifying the average ferrite grain diameter d_f corresponding to a circle to $3.4 \mu\text{m}$ to $7.9 \mu\text{m}$, on the basis of Fig. 4 and the description in paragraph No. [0050] provided on page 18 of the Applicants’ specification, 500 MPa or more of the fatigue endurance after quenching becomes possible. Moreover, by specifying the total x of multiplying factors of the

respective elements to satisfy the value of 1.2 to 1.7, on the basis of Fig. 3 and the description provided from paragraph No. [0046] on page 17 of the Applicants' specification, 500 MPa or more of the fatigue endurance after quenching becomes possible. In addition, by specifying C_{eq} to 0.4 to 0.58 on the basis of Fig. 1 and the description provided in paragraph No. [0041] on page 15 of the Applicants' specification, 500 MPa or more of the fatigue endurance after quenching becomes possible.

Nevertheless, Hasegawa does not disclose, teach or suggest obtaining 500 MPa or more of the fatigue endurance after quenching which is achieved by controlling (a) the average ferrite grain diameter d_f corresponding to a circle, (b) C_{eq} and (c) the total x of multiplying factors according to Grossman. This is because Hasegawa relates to a steel plate used in marine structures and the like and is dissimilar, in terms of use and objects, to a steel pipe suitably used for structural parts of automobiles as specified in Claims 1, 6, 11 and 14. The Applicants thus respectfully submit that the amended Claims 1, 6, 11 and 14 are non-obvious over Hasegawa.

The Applicants note with appreciation the Examiner's comments with respect to the grain size of Hasegawa overlapping the claims. The Applicants respectfully submit that there is no overlap with respect to grain size. As noted above, the Applicants' ferrite grain diameter d_f corresponding to a circle is 3.4 μm to 7.9 μm . This does not overlap with Hasegawa and, as previously noted, Hasegawa fails to provide disclosure, teachings or suggestions that would lead one skilled in the art toward the Applicants' claimed ferrite range diameters. Withdrawal of the rejection based on Hasegawa is respectfully requested.

In light of the foregoing, the Applicants respectfully submit that the entire Application is now in condition for allowance, which is respectfully requested.

Respectfully submitted,



T. Daniel Christenbury
Reg. No. 31,750
Attorney for Applicants

TDC/vp
(215) 656-3381